

Laptop Lessons:

Exploring the Promise of One-to-One Computing

By Kim Carter

What can we learn from schools that have put a laptop computer into the hands of each student? Here, we take a closer look at districts that have successfully gone mobile—and how you can, too.

When Maine Governor Angus King recently proposed using the state's \$50 million surplus to outfit every seventh- and eighth-grade student and teacher in the state with a laptop computer, the phrase "laptop learning" became headline news across the nation. And when the New York City Board of Education approved a plan to provide the city's fourth-grade students and teachers with notebook computers next year—and eventually deploy some 850,000 portable devices to all students, teachers, and administrators in the system—it confirmed that laptop programs have indeed become a full-fledged movement.

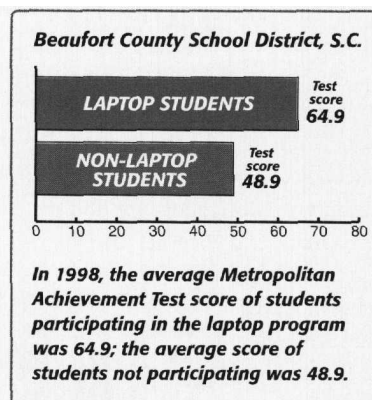
But what does it mean when an entire state and a huge metropolis decide to undertake such large-scale initiatives? What Maine and New York, and an increasing number of communities across the country, are betting on, and what more than 1,000 public and private schools are discovering, is that one-to-one computing—one child, one computer (and not two-to-one or even one and one-half-to-one,

experts stress)—is making a difference. In an age when everyone, from parents to community groups to legislators, is calling for increased accountability in education, and with the prospect of an even more stringent focus on measurement with the Bush administration's "more freedom, more accountability" approach, laptop programs are being viewed as one workable strategy to address such problems as low achievement, poor attendance, and equal access to technology.

The larger premise of the laptop program, however, is that one-to-one computing will ultimately revolutionize the way teachers teach and the way students learn—a desirable and even essential outcome for the digital age. Here, we look at what we know about laptop learning so far—and what challenges schools just starting out can expect to encounter.

The Results Are In

From 1996 through 2000, Rockman *Et Al*, an independent research organization, conducted evaluations



of Microsoft's pioneering Anytime Anywhere Learning program—an initiative that provides hardware, content, training, and other types of support for schools implementing laptop programs. Rockman's key findings are that laptop students spend substantially more out-of-class time on schoolwork, score higher in writing and reading assessments, demonstrate improved research and analysis skills, and engage in more collaborative work than non-laptop students.

Kenneth Stevenson of the University of South Carolina carried out similar

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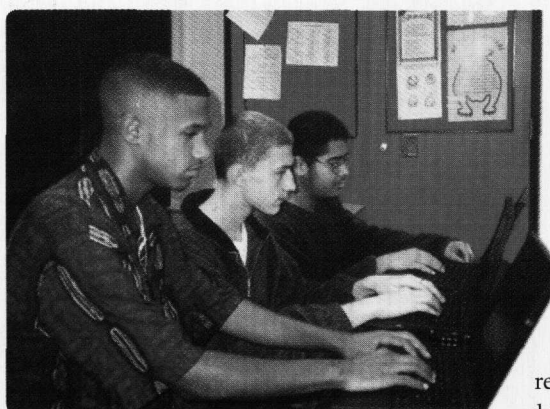


annual evaluations of that state's Beaufort County School District, which serves a broad economic

spectrum, from the affluent Hilton Head Island resort area to rural farming and fishing communities. Second-year results show that students with their own laptops have scored higher on standardized achievement tests than their non-laptop counterparts, with the most significant gains made by those in the free and reduced-cost lunch programs. Third-year results show all laptop students maintaining significant scoring advantages over non-laptop users.

At the Rio Bravo Middle School in El Paso, Texas, where 92 percent of the school's students receive a free or reduced-cost lunch, providing laptops for every student has borne equally dramatic results. Their program, implemented through NetSchools, includes proprietary, infrared-equipped notebook computers for students and teachers; network hardware; and a year's mandated training. After one year of the program being in place, state achievement scores improved significantly, and student attendance rates increased to 97 percent. Based on this progress, the district plans to expand the program to every middle and high school over the next five years.

Participation in laptop programs has come to be associated with more regular school attendance and with students staying in school longer—variables key to learning and achievement. Hartford Public Schools in



"Students' involvement in this program has had a significant impact on the way they view themselves," says Janice Gordon, mobile learning coordinator of Hartford Public Schools, where over 400 laptops are being used at the high school level.

Connecticut provides a good example of this. In 1999, their dropout rate for students after ninth grade was over 50 percent. The school system was determined to turn things around and decided technology was one good place to start. Today, of the 267 students who started with the laptop program, 92 percent have remained in school and in the program.

Janice Gordon, the mobile learning

coordinator who led Hartford's laptop implementation, is much more focused on the qualitative results of the program. In particular, Gordon has observed the change in self-image that disadvantaged students have when

students come out knowing they have tools that will take them beyond high school, they see themselves differently."

In addition to motivating students to stick with school, to work better with others, and to score higher on reading, writing, and achievement tests, studies also show that one-to-one computing increases home-school communication and parental involvement. It has also helped empower teachers to move from traditional delivery modes of instruction

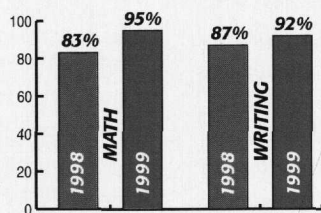
to methods of discovery and interaction, with increased individualization and customization of learning activities and materials.

Getting Started: A Question of Vision

Though the word on laptop programs is mostly positive so far, with the promise of even better results once the model is honed over time, there are certain basic but significant elements essential to the success of any such revolutionary effort. To begin with, there must be a vision. And though traditionally it's often been a technology-inspired creative teacher or technology coordinator driving the effort, it is the superintendents and other high-level administrators who are being called on today to instill the kind of sweeping vision and fiscal power required to make a technology dream a reality.

At the Brewster Academy in New Hampshire, it was associate headmaster Alan Bain who spearheaded the effort to have every student and teacher carry a networked notebook

Rio Bravo Middle School, El Paso, TX



After implementing the schoolwide notebook program, state achievement scores improved from 83 percent to 95 percent in math, and 87 percent to 92 percent in writing.

they're given the same technology tools being used by their suburban counterparts—and the business world at large. "We're fighting a faceless enemy in poverty, apathy, and student motivation," she says. "At the end of the day, when these

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computer. Hiring Bain or another recognized expert with a consulting service (see Resources for Getting Started

on page 46) is one way for schools or districts to acquire assistance in setting up a laptop program. Another way is to research best practices, such as those detailed at the Technology Information Center for Administrative Leadership (www.portical.org).

Money Matters

Once you have your vision and plan in place, the next step is following through with the nitty-gritty details and challenges of implementation. The first hurdle is money. Keeping in mind that costs typically range from \$1,300 for entry-level portables to up to \$2,000 for wireless-ready laptops, there are two big-picture questions districts should consider. First, how will you finance the

Fifth-graders from Shawnee, Okla., work together to manipulate photographs they took at a local art museum. The portable equipment allows them to work with the photos on-site.

laptops—in what increments and over what period of time? Second, who will ultimately pay the bill: the district, families, or some combination of the two? (To learn more about procurement and funding models, see Weighing Your Financial Options on page 44.)

At the Clovis Unified School District outside of Fresno, Calif., which has mixed socioeconomic demographics, parents are encouraged to buy the laptops. In addition to holding Laptop Parent Information Nights, the district answers parents' frequently asked questions

on its Web site (www.clovisusd.k12.ca.us/aal/default.html). The district also makes a guarantee to parents that if they purchase the laptop, their child will be put into an "immersion class" that integrates the computer into the daily curriculum. To ensure equal access, the district complements family-owned laptops with district-owned laptops students can use at school and at home for the entire year.

But what about communities where most families can't afford to pay? At Community School District Six in New York City, where 94 percent of its 30,000 students live at or below the poverty level, school officials have pioneered a leasing

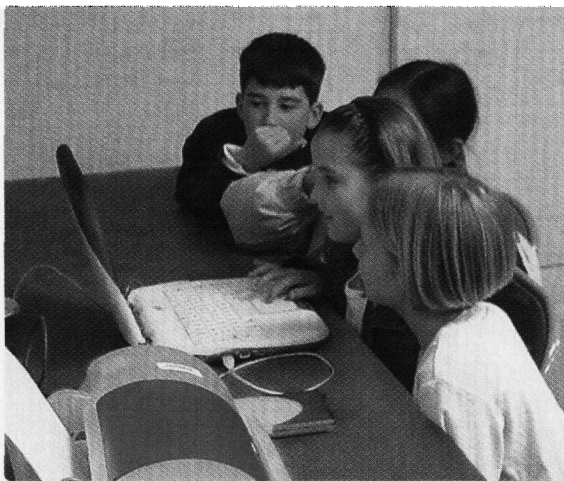


PHOTO COURTESY OF SHAWNEE PUBLIC SCHOOLS

model that combines contributions from parents and the district. Families pay a monthly \$35 co-payment that covers half of the \$70 lease payment—the district pays the other half through Title I funding.

An increasing number of districts are working to establish education foundations to provide funding for laptop programs. The Beaufort County, S.C., community, with the help of Microsoft and Toshiba, has created the nonprofit SchoolBook Foundation to help cover the cost of lease payments for families who qualify. Their

Sample Laptop Projects

Since the Shawnee Public Schools in Oklahoma began their laptop program, director of technology Lynda Nichol says she has observed "more collaboration, more turning control over to kids, and more learning taking place outside of the classroom." One example of this shift is the school's partnership with the local Mabee Gerrer Museum, where students visit with a traveling minilab that contains five Apple iBooks, five printers, and five digital cameras. During a recent photography exhibit, fifth-graders met at the gallery with the artist, who shared his tips and techniques. Students then broke into groups and used the digital cameras to take pictures

inside and outside the museum. Because they had the traveling lab with them, students could download the pictures to the iBooks, work with their art instructor on cropping, layering, and other techniques, and then print out the pictures. The prints were then mounted and proudly brought home.

Other schools have seen an increase in project-based learning since they started their laptop initiative. In Hartford, tenth-grade science teacher Sharon Parker teaches a unit that requires students to write children's books on the cell. Students use laptops to research cell biology on the Internet, write a story with word processing programs, and present it using PowerPoint. Once finished, they read their books to children in nearby elementary schools. Other examples of science and math lessons designed specifically for laptops can be found at www.nsta.org/programs/laptop/grade.htm.

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long-term goal is to reduce family payments to \$35 a month. More information about Beaufort's foundation can be found at www.beaufort.k12.sc.us/learning/schoolbk.

Protecting the Equipment

Concerns about machine fragility, theft, and student responsibility are commonly cited reservations about implementing laptop programs, but these have relatively straightforward

solutions. In Beaufort County, laptops carry a three-year insurance policy that covers loss, theft, and accidental damage. They also use STOP plates (www.stoptheft.com), aluminum tags that are placed on the cover of the laptop along with a toll-free number that can be called

Weighing Your Financial Options

Before you decide who is going to fund the laptops, first consider how you will finance them. There are essentially three main options for procuring the laptops: outright purchase, leasing, and lease/purchasing.

Outright purchasing With outright purchases, the investment is made and inventory is increased. If your funding is unreliable from year to year, this may be the best strategy. It is important to recognize that laptops, like all technology, are an expense outlay with a short depreciation—generally three years. The outright purchase strategy has no built-in mechanism for dealing with obsolescence.

Leasing Most hardware companies now offer a variety of leasing options that run between one and five years. The greatest benefit of a lease is the ability to turn in the equipment for newer machines at the end of the lease period. By basing the term of the lease on the estimated useful life of the equipment, you can stay one step ahead of obsolescence.

Lease/purchasing Similar to leases, lease/purchase plans can have a negotiated buyout cost at the end of the lease term. Financing can be done in installments, with the district (or family) acquiring title to the equipment at the time of the purchase and the company retaining a security interest in that equipment. Companies

offer various options designed specifically for schools, including flexible end-of-term lease options and “tech refresh leases” that allow for technology upgrades during the lease term.

No matter which of these options you choose, someone must put down money, whether it's the family, the district, or a third party. In the end, of course, most districts and schools use a combination of funding sources.

Families If families are responsible for purchasing their own equipment, they can choose between the above options or select from similar options negotiated through the school district, which often can get better terms and more affordable monthly rates than individuals. In this case, the district holds the lease and families pay the district. For families that qualify for free and reduced-cost lunch, several districts use grant or foundation money to establish sliding-scale payments.

Districts If district funds are to be used, this can be done as a special bond appropriation or within the operating budget. Bond appropriations are ultimately an expensive strategy for technology purchases—it's a huge investment for equipment that will be obsolete within three years. Technology is also an enormous expense within an operating budget.

Once such an expense is established, however, long-term planning and program development is more consistent and continuous.

A variety of federal grants support laptop purchasing, including Title I, Perkins Grant, and Technology Literacy Challenge Grant funds. For detailed information about technology grants, check out *Technology & Learning's* searchable online database at www.techlearning.com/grants.html.

The Foundation Model Another approach is to create an education foundation in your district that can help fund your laptop program. Though written in 1991, Jamie McKenzie's “The Art of the Deal—No Trump” (fno.org/fnosept91.html) remains a timely presentation of how to start such a foundation. “The Funding Puzzle” (www.electronic-school.com/0696f5.html), by Anne Ward, also is helpful, providing several examples of different districts' foundation-developing strategies.

Recently, Microsoft has been testing out ways to provide schools with a template-based blueprint for starting nonprofit “e-learning foundations” for equipment and training. While this is still in the nascent stages in the U.S. market, look for Microsoft to ramp up this idea in the coming year.

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to track down the owner (the company that makes the plates matches the serial number to the owner). If the plate is removed, a "tattoo" appears identifying the laptop as stolen property and displaying the toll-free number yet again. "We've had several laptops go astray and have received calls from the company followed by the return of the machines," says instructional technology specialist Cyndi Pride.

Hartford computers are also purchased with insurance. In addition, parents are briefed during laptop distribution sessions and students are trained in care for the

A study of the Beaufort County Schools, where 2,500 students use notebook computers on a daily basis, found that girls participating in the laptop program perform as well as their male counterparts.



PHOTO COURTESY OF BEAUFORT PUBLIC SCHOOLS

laptops and security procedures. Hartford's student safety procedures include instructions to "never take the laptop out of its carrying case in public places outside the school setting," "never travel alone with the laptop," and, if confronted, to "not hesitate to give up the laptop. The laptop can be replaced." So far, Hartford's rate of loss has been less than 5 percent.

In the case of NetSchools' portables, their proprietary configuration means that the machines lose significant functionality when removed from the NetSchools network—and the computers tell users as much when they boot them up. As a result, NetSchools says that less than 1 percent

Resources for Getting Started

Here, some places to go to learn more about laptop programs, get professional development ideas, or just keep up with the movement.

At the **Beaufort County Schools Learning with Laptops** Web site (www.beaufort.k12.sc.us/district/laptops.html), you can download Kenneth Stevenson's detailed research reports on the impact of the laptop program on the district.

The **Endeavour Group** (www.theendeavourgroup.net) is an educational research and consulting group that provides schools with a planning and implementation process known as the School Design Model. The model, in which laptop computing is one component, was tested by CEO Alan Bain at Brewster Academy in New Hampshire.

partnership with Hewlett-Packard.

Three years of **Rockman Et Al's** research on schools participating in Microsoft's Anytime Anywhere Learning program is available at rockman.com/projects/laptop. The first-year report explores the implementation process and initial impacts on teaching and learning; the second and third year focus more on the long-term impact on teaching and learning, and participant experiences.

SchoolKiT (www.schoolkit.com) offers a free library of learning activities and templates for integrating technology into the curriculum. SchoolKiT GOLD, an online subscription service, provides additional activities and a professional development database for teachers. SchoolKiT recently acquired Intouch with Learning (www.intouchlearning.com), which offers a suite of professional development services.

The final report from the **Task Force on Maine Learning Technology Endowment**, which recommended that "portable, wireless computer devices" be given to every teacher and student in the state, can be found at www.state.me.us/legis/opla/mlte.htm.

The Board of Education for the New York City public school system created a **Teaching and Learning in Cyberspace** task force (www.nycenet.edu/studentweb/flash/background.html) to develop a vision for integrating technology tools—including notebook computers—into instruction throughout the system.

The **1999 Toshiba/NSTA Laptop Learning Challenge** rewarded twenty K-12 educators for their innovative uses of laptop computers. Winning lesson plans are available at www.nsta.org/programs/laptops/grade.htm.

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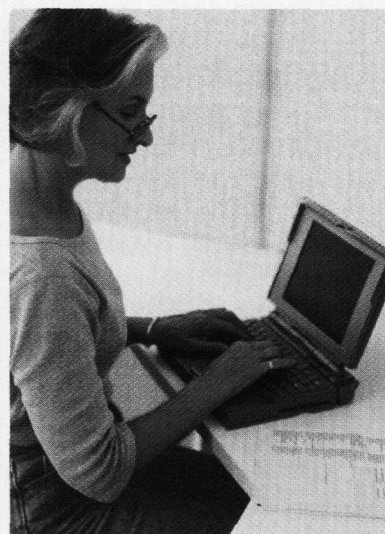
of student computers have been reported stolen. With a magnesium case and water-resistant keyboard, the notebooks are also quite durable. "They're not indestructible, certainly, but they hold up very well," says Juan Orrantia, campus technology coordinator for El Paso's Rio Bravo school.

Getting Staff Up and Running

One of the biggest challenges to making a laptop program work—one far more complex than theft and machine durability—is that it requires a new approach to teaching, and this means lots of extra training and support. Janice Gordon of Hartford

At Clovis Unified, teachers who commit to laptop teaching and the requisite training and professional development receive laptops and continued support.

Public Schools is unequivocal about this. "Service is an essential part, yes, so machines are up and running, but the key is teachers," she says. "This is a paradigm shift, and it's going to be difficult for some teachers." Through the Professional Development Academy developed by the University of Connecticut (www.pdacademy.uconn.edu), Hartford teachers are first trained to be proficient in Microsoft Office and the Internet, then they move on to full technology integration into the curriculum. To motivate teachers to stick with it,



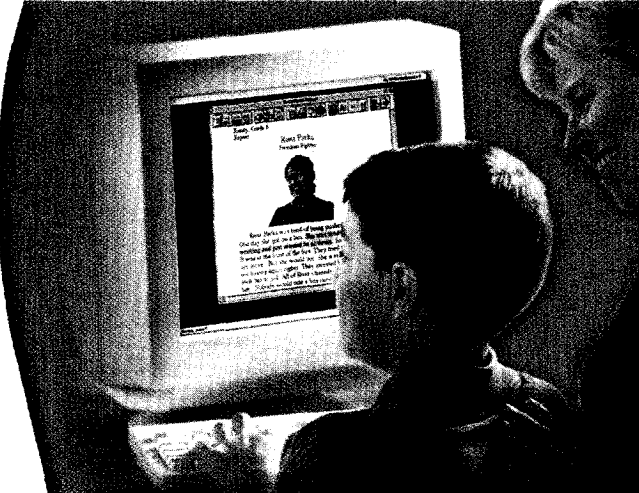
/PD_tech_train.htm.) Clovis also makes extensive use of Intouch with Learning (www.intouchlearning.com) and www.SchoolKIT.com, which provide teacher training as well as specific classroom activities.

At the Shawnee Public Schools in Oklahoma, teachers who sign on to the laptop program participate in Teacher Summer Camp, a six-week series of programs on different topics from basic word processing to model laptop lessons. Teachers receive a stipend along with a computer, digital projector, printer, and software for their classroom. Shawnee also encourages parents to use computers by offering basic training at their Parent Resource Center and by providing laptops that parents can check out for three weeks at a time.

New York's Community School District Six offers yet another approach to professional development for laptop programs. Teachers start with 32 hours of beginning training that includes model lessons and in-class demonstrations, plus ongoing staff development throughout the year. In addition to getting support from technology facilitators, staff can take advantage of diagnostic tests, tutorials, and

Gordon sends technology facilitators into the classrooms to co-teach technology-integrated lessons.

Clovis Unified takes advantage of teacher leaders as well. Four teachers are on special assignment, working one-on-one with teachers to integrate technology. Initial teacher training comes in two phases. Phase one is a series of courses that help teachers master such basics as Word, PowerPoint, and Excel. Phase two supports technology integration into classroom practice. (Rubrics and course outlines can be downloaded at www.clovisusd.k12.ca.us/connected



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curriculum ideas at the district's laptop news Web site (www.csd6.org/laptopnews/staff_development).

What's Ahead?

Although laptop programs continue to grow steadily, there has been much discussion of late about the emergence of handheld computers in schools. Some even say handheld computers, with prices hovering at \$450 and below, are the best chance schools have to provide one-to-one computing for every student. What does this mean for laptop programs?

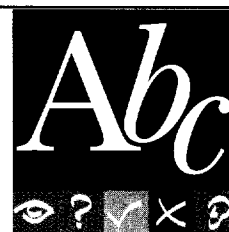
Laptop proponents counter with the argument that—while handhelds are more portable and less expensive, can facilitate real-time data collection through probes, and allow for reading and writing text—today's handheld computers are not considered direct competitors to laptops. For one, they don't have the power of desktop or notebook computers for handling large files and multimedia creation. In addition, their small screens are not well suited for large amounts of data input, and they require a keyboard attachment for any significant word processing tasks (try to imagine students writing a five-page English paper on their handheld).

It is more generally agreed among industry experts that the biggest trend transforming mobile computing for schools is wireless networking. Increasingly, districts are moving toward wireless technology to provide connectivity for hard-to-wire older schools and to expand the network into portable classrooms. Perhaps more importantly, wireless networking allows administrators, teachers, and students the flexibility to make full use of the Web in and out of the classroom, and the means to connect and collaborate no matter what their location. Wireless networking appears to be the most

logical extension of the anytime, anywhere—and any student—computing ideal that laptop programs have come to embody. Stay tuned for major changes within the next few years. ■

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